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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/809,379	03/15/2001	Erik C. Houge	ANTONELL 3-1-18-1-20	5771

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EXAMINER

STREGE, JOHN B

ART UNIT	PAPER NUMBER
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2625

DATE MAILED: 02/11/2004

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/809,379

Applicant(s)

HOUGE ET AL.

Examiner

John B Strege

Art Unit

2625

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 March 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 March 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-6, 8, 17-22 are rejected under 35 U.S.C. 102(e) as being anticipated by Jun et al. USPN 6,366,688 (hereinafter "Jun").

Regarding claims 1-6 Jun discloses a system for detecting contact failures (defects) using a scanning electron microscope (at least col. 1 lines 14-15, and col. 6 lines 65-67 continued on to col. 7 lines 1-2). The scanning electron microscope reads image data for a semiconductor wafer (at least col. 2 lines 29-31, and col. 9 lines 25-27). An intensity profile is generated for the contact holes using the image data (at least col. 3 lines 42-45 and col. 9 lines 31-32). The intensity profiles are analyzed to identify contact failures (col. 9 lines 36-37). A vertical or horizontal line is placed at a first position of the image, and the intensity values along the line (intensity line) are summed to determine a total intensity for the line (col. 13 lines 6-8). This is repeated for multiple

positions of the image (plurality of intensity lines) (col. 13 lines 8-12) to define the shape and structure of each hole in order to analyze the holes for contact failure (col. 13 lines 18-20, and 26-28). Multiple holes are checked for defects, thus defects are determined for each line. Regarding claim 8 using the intensity a threshold is set, the background intensity value is subtracted from all the pixels, and a total number of intensity pixels is counted (at least col. 3 lines 58-67 continued on to col. 4 lines 1-3).

Claim 17 recites similar limitations as claim 1, thus the arguments used for the rejection of claim 1 apply equally to the limitations of claim 17.

Claim 18 recites similar limitations as claims 2-3, thus the arguments used for the rejection of claims 2-3 apply equally to the limitations of claim 18.

In regards to claim 19, Jun discloses that a computer is part of the processing unit (col. 7 line 33-34) (10 fig. 3) and the computer has a display (operator interface).

Claim 20-22 recite similar limitations as claims 4-6, thus the arguments used for the rejection of claims 4-6 apply equally to the limitations of claim 17.

3. Claims 1, 7-9, 11, 17, 22-23, 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Lee et al. USPN 5,808,735 (hereinafter "Lee").

In regards to claim 1, Lee discloses a method for detecting and characterizing defects on a semiconductor wafer. A surface is scanned (col. 4 lines 32-35) and a three dimensional profile of the intensity of the surface is then prepared (col. 4 lines 44-46). This profile is used to detect defects on the tests surface (col. 3 ines 38-40).

Claim 7 discloses selecting a plurality of intensity line profiles from the intensity profile and determining a defect density of the plurality of intensity line profiles. Lee

discloses accounting for different layers (plurality of intensity profiles) by separately analyzing the image properties of each layer to establish an optimum intensity-error threshold for each area (col. 6 lines 1-4). For each potential defect area the defect density is determined (col. 7 lines 11-13).

Claim 8 discloses determining a total number of intensity pixels. Lee recites creating an intensity histogram that determines a total number of intensity pixels that exceed a threshold (col. 6 lines 26-28). A histogram determines a total number of pixels therefore the creation of a histogram meets this limitation.

Claim 9 recites "wherein determining a total number of intensity pixels includes determining a number of background intensity pixels and a number of defect intensity pixels." Lee recites that an intensity histogram is created with the defect pixels (col. 6 lines 23-26) as well as with the non-defect (background) pixels (col. 6 lines 34-37).

Claim 11 recites "the total number of intensity pixels comprise a histogram, and the background intensity pixels are inside a desired sigma value and the defect intensity pixels are outside the desired sigma value." Lee discloses a histogram as stated above. Furthermore, Lee discloses an intensity threshold to differentiate between defect and non-defect pixels where those pixels that differ by an amount (sigma value) exceeding the intensity threshold are identified as defects (col. 6 lines 22-26).

Claim 17 recites similar limitations as claim 1, thus the arguments used for the rejection of claim 1 apply equally to the limitations of claim 17.

Claim 22-23 recite similar limitations as claims 8-9, thus the arguments used for the rejection of claims 8-9 apply equally to the limitations of claims 22-23.

Claim 25 recites similar limitations as claim 11, thus the arguments used for the rejection of claim 11 apply equally to the limitations of claim 25.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 10, 14-15, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. USPN 5,808,735 (hereinafter "Lee") in view of the teachings of Peairs et al. USPN 5,867,597.

Claim 10 is dependent on claim 9 and discloses "determining a defect density by dividing the number of defect intensity pixels by the total number of intensity pixels." Lee does not explicitly disclose this. Lee does disclose normalizing the three dimensional profile of intensity (col. 6 line 42) however does not go into details as to how this is done.

Normalizing an image is well known in the art of image processing, and one way to do so is to divide the pixels of interest by the overall number of pixels in the image. This is taught by Peairs, who recites, "the pixel density is then just the number of black pixels (pixels of interest) divided by the total number of pixels in the box" which he refers to as the "normalized density" (col. 7 lines 3-5).

Lee and Peairs are analogous art because they are from the same field of endeavor of image processing.

At the time of the invention it would have been obvious to one of ordinary skill in the art to normalize the intensity profile of Lee in the well known manner of dividing the number of defect pixels by the total number of intensity pixels. Peairs teaches that it is a typical way of normalization, therefore the motivation for doing so would be to normalize the intensity in the manner typically used. Therefore it would have been obvious to one of ordinary skill in the art to combine Lee and Peairs in order to obtain the invention as specified in claim 10.

Regarding claims 14-15, Lee discloses three-dimensional profiles of the intensity (col. 4 lines 44-46) and these images contain a plurality of pixels (as stated at least col. 6 line 26). Lee further discloses using the average of the intensity to determine a potential defect area (col. 5 lines 15-17 and col. 8 lines 17-37).

Claim 24 recites similar limitations as claim 10, thus the arguments used for the rejection of claim 10 apply equally to the limitations of claim 24.

6. Claims 12-13, 16 and 26-28 rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. USPN 5,808,735 (hereinafter "Lee").

Claims 12-13 specify setting the sigma value to be greater than two sigma, and 4 sigma.

At the time the invention was made it would have been obvious to a person of ordinary skill in the art to use sigma values greater than two sigma and four sigma because applicant has not disclosed that using sigma values greater than two sigma

and four sigma provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with a different threshold such as that set by Lee. Therefore it would have been obvious for one of ordinary skill in the art to modify Lee to obtain the invention as specified in claims 12-13.

Claim 16 is dependent on claim 1 and discloses, "obtaining an image of an inner surface of a tubing located in a semiconductor wafer manufacturing facility." Lee does not explicitly disclose obtaining an inner surface of a tubing located in a semiconductor wafer manufacturing facility. However, one of ordinary skill in the art would know that a defect detection system can be used with various types of defects that occur in the production process. Therefore it would have been obvious to one of ordinary skill in the art to use the invention specified by Lee to detect defects within semiconductor tubing manufacturing processes.

Claims 26-27 recite similar limitations as claims 12-13, thus the arguments used for the rejection of claim 12-13 apply equally to the limitations of claims 26-27.

Claim 28 discloses a similar limitation to claim 16, thus the same argument can be applied to the rejection of claim 28.

7. Claims 29-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jun et al. USPN 6,366,688 (hereinafter "Jun") in view of Henley USPN 5,406,213.

Claim 29 discloses the same limitations as claim 1 with the additional limitation of "rejecting the material based upon a number of the defects in the material's surface".

As discussed above Jun discloses all of the limitations of claim 1. Jun does not explicitly disclose rejecting the material based on the number of defects.

Henley discloses a method for inspecting defects in liquid crystal display plates and recites, "if a certain number of permissible defects in a liquid crystal display element... is predetermined, a user is able to judge acceptance or rejection of liquid crystal display base plate based on the data resulting from the processed image" (col. 9 lines 22-28).

Jun and Henley are analogous art because they are from the same field of endeavor of defect inspection using image processing. At the time of the invention it would have been obvious to one of ordinary skill in the art to combine Jun and Henley in order to reject the semiconductor device based on the number of defects found. The motivation for doing so would be to apply the defect information gained in a manner to decide the quality of the product. Therefore it would have obvious to combine Jun and Henley in order to obtain the invention as specified in claim 29.


Examiner declares official notice for claim 30. Claim 30 states that the material is a subset of a batch of the material and rejecting includes rejecting the batch of the material. It is well known in the art to select from a lot of semiconductor wafers in order to speed up the inspection of wafers, since it is not efficient to inspect every wafer. Therefore the limitation of claim 30 would have been obvious to one of ordinary skill in the art at the time of the invention.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John B Strege whose telephone number is (703) 305-8679. The examiner can normally be reached Monday-Friday between the hours of 9AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (703) 308-5246. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


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